**When do Natural Disasters Lead to Negotiations in a Civil War?**

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**Abstract:**

The effect of natural disasters on the end of civil wars has received little attention from scholars. We argue that the effect of disasters on conflict negotiation is dependent on which combatant is victimized by disaster. Drawing on a bargaining model, we argue that disasters create costs that alter the capabilities of the rebels and government. In order for these changes to lead to negotiations, the effects of a disaster have to lead to the mutual expectation that military victory is unlikely in the short term. When both sides are hit by a natural disaster, this mutual expectation is likely to form because both sides face significant costs to engaging in conflict in the short term. When one side is impacted, the non-affected side is likely to see an opportunity to gain against its rival while the side facing the devastation of a natural disaster may see only a temporary setback that it can recover from. This may lead both sides to not update their beliefs about the costs of war, or their chances of victory. We evaluate these hypotheses by examining all territorial civil wars from 1980-2005 using a more precise measure of disaster location. We find that when both sides are hit by a disaster, the likelihood of negotiation consistently increases. When only one side is impacted, the effect on negotiations is not consistent across model specifications.

**Keywords:** Civil war, Natural disaster, Negotiation

 How do natural disasters influence the onset of negotiations between the government and a rebel group in a civil war? Natural disasters have been shown to have divergent effects. Take the case of the 2004 tsunami; in Indonesia, the event led to successful negotiations between the Indonesian government and GAM (Free Aceh Movement). Conversely, in Sri Lanka, the same event did not lead to peace negotiations. In fact, conflict continued between the LTTE and the government, even leading to struggles over the distribution of aid (Bauman, Ayalew & Paul, 2007; Beardsley & McQuinn, 2009; Le Billon & Waizenegger, 2007).

The Philippines provides another example of the differing effects of a natural disaster on negotiations. The New People’s Army (NPA), a secessionist rebel group, has faced two strong typhoons in the past 15 years in areas under its control. In neither of these cases did the NPA seek negotiations with the government, instead declaring a unilateral cease-fire until they were ready to engage in conflict again (Walch, 2014, 2018). Just as these three cases all saw different outcomes after large natural disasters, research on the relationship between natural disasters and civil conflict has produced a wide variety of results. Some find that disasters provoke and exacerbate civil conflicts (Berrebi & Ostwald, 2011), while others argue they can lead to negotiations and reduce the likelihood of conflict (Kreutz, 2012). We address these divergent findings by more precisely addressing disaster location, which of the combatant sides it impacts, and its effects on the start of negotiations. This level of precision allows us to see that disasters have a nuanced effect on civil conflict; dyads can move towards negotiations when both sides are hit by a natural disaster.

 Looking at this question is important for a few reasons. First, it helps to address disparate findings in the literature. Research on the effect of disasters has presented a variety of theoretical arguments and divergent findings, making it necessary to clarify the conditions under which natural disasters influence the likelihood of a negotiation in a civil conflict. Second, understanding this question can help policymakers understand when parties in a civil war might be in a position to start negotiations. While the death and destruction that results from a disaster is regrettable, the vast heterogeneity of disasters and their impacts can provide third parties with a useful predictive tool to determine when parties might negotiate. Moreover, this may also provide a useful pressure point that allows third parties to come in and be effective mediators for a successful conflict resolution.

To address this question, this article argues that which combatants are hit by a disaster are likely to influence when a natural disaster produces negotiations in civil war. While disasters can weaken the government (Eastin, 2016), this effect can also be true for rebels if they hold and govern territory. However, this can only impact the combatants’ likelihood of negotiation dependent on how each side evaluates the impact of the disaster. Drawing on a bargaining model, we argue that disasters that create a joint expectation in the inability to achieve military victory in the short term lead to negotiations. Specifically, only when governments and rebels are both hit by a disaster do we expect disasters to promote negotiations. When only one of the combatants experiences a disaster, the effect on their expectations about military victory and the change in pre-disaster information for both parties is less clear, thus not changing the likelihood of negotiations.

We examine these theoretical arguments on civil war dyad/months for all territorial civil wars from 1980-2005. We code whether a natural disaster hit the government, rebels, or both in a given month and a few subsequent months afterwards and use a logistic regression model to evaluate the effect of disasters on negotiations. Our results indicate a positive effect of natural disaster – only when both sides are hit – on the likelihood of negotiation. This effect does not occur when only one side is hit. We also find that the effect of simultaneous disasters on government and rebels is not as robust when only looking at rapid-onset disasters.

**Literature review**

 The existing literature on the role of natural disasters on civil conflicts has produced a range of theoretical arguments and empirical findings. In essence, the literature argues that disasters can promote and prolong conflicts by contributing to grievances or by weakening the government. At the same time, others have argued that disasters can forestall and shorten conflicts. Disasters can shock a populace, bringing people together rather than driving them apart. And, akin to the argument linking disasters to government weakness, disasters can weaken rebels, thus preventing and shortening conflict.

*Conflict inducing*

 Research that argues natural disasters have a positive impact on the likelihood and duration of civil wars makes several arguments. First, disasters can weaken the government because it forces governments to divert money and troops to impacted areas. This diversion can weaken efforts against rebels, thus providing them with an opportunity to challenge the government through force (Berrebi & Ostwald, 2011). This is especially noted for terrorism, as the diversion of security forces to other parts of the country and to other targets increases the likelihood that the newly vulnerable targets are struck. To this end, Berrebi & Ostwald (2011, 2013) find that terrorism increases in the aftermath of disaster.

 In addition to weakening the government, natural disasters can erode support for the government. This can particularly occur if the government response is slow, unequal, or ineffective (Berrebi & Ostwald, 2011). An unequal, or differential, response for groups that might already feel marginalized by the government could further inflame an aggrieved group, increasing the likelihood of a civil war (Berrebi & Ostwald, 2011). As Wood & Wright (2016) argue, the mobilization of aggrieved people due to disaster can also lead to repression by the state, thus again increasing the risk of violence. This is further exacerbated when the disasters have a rapid onset and occur in states that are already at risk for civil war (Berrebi & Ostwald, 2011; Brancati, 2007; Nel & Righarts, 2008).

 Similar to the research on how natural disasters increase the likelihood of conflict, Eastin (2016) argues that a government weakened by a disaster allows rebels who are already at war with the government to better stay in that conflict. A weakened government will have a harder time fighting the rebels, allowing the civil war to last longer. The destruction of infrastructure caused by a natural disaster can also increase the ability for rebels to avoid detection by the government, increasing the opportunity for insurgency. These arguments are supported empirically as disasters are shown to lengthen the duration of civil wars (Eastin, 2016).

 Finally, while not directly about natural disasters, Narang (2015) finds that humanitarian aid, aid which is often given after a natural disaster, can prolong civil wars by clouding the informational environment about the relative capabilities of either side. When rebel groups receive humanitarian aid, their costs of fighting are subsidized, they may even have zones of protection, and they can provide goods to a local population to maintain their support (Narang, 2015). This makes it harder for the government to correctly evaluate the capabilities of the rebels in terms of determining whether they are likely to accept a settlement.

*Conflict preventing*

 Research in this area focuses on how disasters produce national unity due to shared threat. Victims of a disaster may cut across different populations, leading to a sense of solidarity and reducing tensions that may have led to civil conflict (Renner & Chafe, 2006; Slettebak, 2012). Rather than focusing on the intangibles of national unity, another argument simply states that the devastation of disasters can weaken the ability of rebels to mobilize to challenge the government (Salehyan & Hendrix, 2014). Further, the destruction following a disaster can reduce – or eliminate – the effectiveness of geography and vegetation that rebel groups use to level the playing field against the government (Salehyan & Hendrix, 2014)

 Disasters can also create situations where negotiations are more likely following a civil war. Drawing on the arguments of those who argue that civil wars are more likely after a disaster because governments are weakened, some argue that governments in a civil war weakened by a disaster are likely to make more favorable bargains with rebels. As their relative position declines, they make offers that are more likely to be accepted. This decline can be due to the government reallocating its resources or the destruction of critical state infrastructures. The result is that after a disaster, negotiations and ceasefire are more likely though there is no effect on the establishment of a peace agreement (Enia, 2008; Kreutz, 2012).

A final area of research evaluates when rebels and governments cooperate on disaster relief. Walch (2014) argues that which rebels worked with the Philippine government is based on the legitimacy of the rebel groups to a local population and the pre-disaster relationship of the government and rebels. He finds that after a 2012 typhoon hit the Philippines, the Moro Islamic Liberation Front worked with the government while the New People’s Army did not. The Moro Islamic Liberation Front had lower levels of conflict with the government and were less concerned that government aid would weaken their ties to the population. The result was that they worked with the government in disaster recovery (Walch, 2014).

**Theory**

 Drawing on this existing literature, we argue that the likelihood of negotiations following a natural disaster is based on whether both or only one side experiences a natural disaster. The divergence in findings in the existing literature could be driven by aggregation decisions – past research may have only evaluated whether the country experienced a natural disaster, not which combatants experienced the natural disaster. We expect that it is likely that who experienced the disaster could change the willingness of each party to negotiate an end to the civil war. Looking at who was impacted by the disaster and how differential impacts leads to negotiations begins to disaggregate the effect of disasters and allows us to study indirect pathways between disasters and negotiations in a civil war (von Uexkull & Buhaug, 2021).

 We start by analyzing the decision to negotiate through a bargaining model. Similar to other works that examine civil war termination within a bargaining model (Findley, 2013; Narang, 2015; Thyne, 2012; Wolford, Reiter & Carrubba, 2011; Wood & Kathman, 2014), we model government and rebel actions as ways of revealing information to the other side so they can converge on their expectations of power and resolve. Similar to inter-state models of bargaining, governments and rebels begin a civil war because of divergent expectations about each other’s capabilities or resolve. If both sides knew the other’s power and resolve with certainty, they could find a settlement that would avoid the costs of conflict by knowing the outcome of a conflict. In other words, they would both have the same expectation of what would happen in a conflict and thus could agree on the settlement that would inevitably happen while avoiding the costs of conflict (Fearon, 1995). Since both sides have private information about their resolve and capabilities and have incentives to misrepresent that information to get a better bargain from the other side, each side’s expectations about the outcome of a conflict and thus what a settlement should be are divergent (Fearon, 1995). Because of these divergent expectations and the inability to trust the other side, both sides use conflict to reveal information.

As two sides fight, they reveal information about each other, allowing their expectations to converge to the point that they are able to agree on a settlement (Filson & Werner, 2002; Narang, 2015; Reiter, 2003). Conflict is a way for these actors to further convey information that can then influence the initiation and outcome of a settlement (Findley, 2013; Park, 2015; Walter, 2009). Civil war scholars have used this framework to develop additional insights, including: when negotiations versus long-term peace are likely to happen (Findley, 2013), when mediation is likely to occur (Greig & Regan, 2008), the effect of foreign aid on delaying the transmission of information (Narang, 2015), how uncertainty over conquest versus power can lead to different kinds of learning during a war (Spaniel & Bils, 2018), and the role of civilian victimization on influencing the bargaining process between rebels and the government (Wood & Kathman, 2014).

In addition, a number of scholars have focused on the role of domestic politics in the bargaining process. Research that has looked at the pre-war stage have found that democracies and autocracies that can convey credible costs of leadership removal are better able to signal information about their resolve, making them more likely to jointly reach a pre-war settlement or prevail in a crisis (Fearon, 1995; Schultz, 1998, 2001; Weeks, 2008). During a war, domestic politics could influence the cost sensitivity and thus resolve of leaders (Filson & Werner, 2007). Domestic conditions that make it easier to convey information could also shorten the duration of a civil war; Thyne (2012) finds that states with executives that were stable and had greater institutional strength experience shorter civil wars. The likelihood that a leader stays in power after a war’s outcome based on the expectations and cost sensitivity of their winning coalition could influence the onset and outcome of negotiations (Mattes & Morgan, 2004).

We use the bargaining model and the idea of convergent expectations to understand how a natural disaster can influence the likelihood of negotiations. Drawing on this framework, we argue that the impact of a natural disaster can serve as a temporary negative shock to the capabilities of the side that is hit. Existing work has argued how a natural disaster can weaken the government (Berrebi & Ostwald, 2011; Eastin 2016; Enia, 2008; Kreutz, 2012). Rebels can also be weakened if they control territory. Rebel control and governance does not have to include formal governing structures like a court system or social service provision, rather rebel control and governance means that at a minimum, since there is contestation between the rebel and government for control of the territory, the rebels receive some form of support from the populace within that territory.

 In situations where rebels have even this minimal degree of control and governance, natural disasters can impact them in a few ways. Disasters can create hardships and acute resource shortages (Walch, 2018). For rebels, this has two important consequences. Resources can be directly reduced as rebels face physical destruction in their territory and revenue is lost from a diminution of economic activity (Walch, 2018). For some groups, reduced resources will limit their ability to provide social services or fund military operations. This temporarily reduces rebel capacity, putting them in a position where they are vulnerable to the government.

 The other consequence is a potential loss of legitimacy for not appropriately responding to a disaster in their area. If a rebel group has a presence in an impacted area, there may be expectations that they will assist with the recovery and relief efforts. Failing to do so could cause people to question their ability to govern and weaken their claim about being better able to support people than the government. Rebels may then have to divert resources and troops from fighting the government to relief efforts in order to maintain their legitimacy. This again weakens their ability to fight the government relative to their ability before the disaster. The other option is to not divert resources, which risks reducing support from within their territory.

 In addition to having to decide about providing support, rebels also have to contend with outside actors – including the government they are fighting - offering aid and support. When outside actors provide support, this can further erode the legitimacy of the rebel group (Walch, 2018). At a minimum, relief supplies may have the name of the group sending the aid, which may include the government. Rebel groups will also face the issue of having to decide whether to allow non-rebel relief workers into the territory to provide aid and assist with disaster recovery. Refusing to do so could further erode a group’s legitimacy as they may be seen as preventing needed help. However, letting outside actors in risks allowing those actors to expand their influence in rebel-controlled territory, particularly if is the government. The government could use the opportunity to promote their own benevolence and governing abilities as well as potentially learn more about rebel-controlled areas. Governments can face similar dilemmas when outside aid is offered. Rebels could co-opt the aid to support their organizations. Aid agencies could observe and report on human rights abuses or other problems in the state, questioning the government’s legitimacy.[[1]](#footnote-1)

 For both the rebels and government, disasters can serve as shocks to their capabilities in terms of their military personnel, infrastructure, and ability to maintain legitimacy. Within the bargaining framework, these exogenous shocks[[2]](#footnote-2) should lead both sides to update information about their capabilities relative to the other side. There are three ways that a natural disaster can impact the likelihood of negotiations in a civil war: when only the rebels are struck, when only the government is struck, and when both groups face the impact of a natural disaster. The effect of each of these differs in how it influences the likelihood of both sides pursuing negotiations.

 Our theory focuses on the onset of negotiations and not the outcome of those negotiations. What leads to a negotiation may be different than what leads to a settlement and peace (Findley, 2013). We argue that negotiations are more likely when both sides perceive an inability to win in the short term (Findley, 2013; Zartman, 1989) and disasters impact that short term calculus in different ways depending on who is hit by the natural disaster. We draw on Findley (2013) who argues that military stalemates can produce negotiations because of a perception by both sides that victory is unlikely in the short term so the benefits of negotiating are greater than continued fighting.

 Whether a natural disaster produces a belief that victory in the short-term is less likely is dependent on who is hit by the disaster. This belief is likely to occur when both sides are hit by a natural disaster. When both sides experience a disaster, they simultaneously experience the costs previously described: loss of infrastructure and personnel, diversion of resources and troops, and possible loss of legitimacy (Berrebi & Ostwald, 2011; Eastin, 2016; Enia, 2008; Kreutz, 2012). Thus, both sides update their beliefs about the possibility of victory given the costs they are facing. Since the government and rebels observe the devastation that they and the other side experienced, they are more likely to perceive a mutual inability to win in the short-term as well as higher costs for waging war. The negative effects of a disaster make fighting costlier than normal given the scarcity of resources and personnel and the need to divert both to disaster relief. Fighting, as opposed to using troops and resources for disaster relief, may not be realistic after a disaster and may create tremendous public backlash if relief efforts are not carried out. Fighting may also have high costs in terms of international support if international organizations, NGOs, or foreign government representatives are helping with relief efforts.

 With both sides perceiving a lower chance of winning in the short-term and higher costs for fighting, their expectations about the benefits of negotiations relative to fighting should go up. Because both sides’ expectations are moving together, their expectations on the benefits of negotiation should converge leading to a greater likelihood of negotiation between warring parties. This leads to our first hypothesis.

**Hypothesis 1**: *When both the government and rebels experience a natural disaster, the likelihood of negotiations should increase.*

 While there are many factors that led to negotiations, and ultimately a settlement in Aceh, the 2004 tsunami contributed by creating a situation where military victory was not seen as possible by either side. Both sides were severely impacted by the tsunami, though differently in terms of troops, infrastructure, and other losses (Bauman, Ayalew & Paul, 2007; Le Billon & Waizenegger, 2007). While the GAM rebels in Aceh were experiencing setbacks prior to the tsunami (Bauman, Ayalew & Paul, 2007), the disaster highlighted to both sides the difficulty in restarting conflict and thus the need to negotiate. GAM and the Indonesian government could not return to conflict for a few reasons. First, the Indonesian military could not focus its efforts against GAM because of losses to the tsunami and the need to use troops for disaster recovery (Le Billon & Waizenegger, 2007). Perhaps more importantly, all parties saw the international aid, attention, and support of the Indonesian people as barriers to engaging in conflict (Gaillard, Clavé & Kelman, 2008). While these factors are not about the ability to win militarily, they do serve as significant costs to re-starting conflict for both sides. These costs were catalyzed by the far-reaching impact of the tsunami to both sides.

 When only one side is hit by a natural disaster, there is not likely to be an increased chance of negotiations. Even though territory under control of the government or rebels is negatively impacted by a disaster and they are likely to face resource issues from the devastation (Kreutz, 2012), the impact this has on the expectation of victory by either side is not likely to lead to a desire to negotiate. First, the side that is not hit by a natural disaster is likely to observe the loss of infrastructure, the diversion of troops and resources to impacted areas, and the further reduction in capacity of the side facing a natural disaster. This perceived change in power could lead the non-affected side to believe it has a greater chance of victory, reducing their incentives to negotiate (Wittman, 1979).

However, the expectation of the side facing a natural disaster may not equally change in terms of their chances of victory. While the impacted side knows that it has been negatively affected, it may perceive this as a temporary loss of resources that it can recover from over time. Thus, it may not believe that the long-term chances of victory have moved significantly. Unlike battles, which convey information about the probability of victory relatively equally to both sides (Filson & Werner, 2002; Reiter, 2003), a natural disaster that only hits one side could produce unequal expectations and thus not facilitate a convergence of expectations.

 Unlike the situation where both sides are hit by a natural disaster, when only one side faces this problem, it is less likely to lead to a mutual perception about the inability to win the conflict in the near term. The side that is not hit may either see an opportunity to win through force or may have higher expectations of what would be required from the other side to enter into negotiations. The side experiencing a natural disaster may not adjust their chances of victory to the degree that the other side has, leading to a situation where the expectations of both sides have not converged to the point of seeking negotiations. This leads to the next hypothesis.

**Hypothesis 2**: *When only the government or rebels in a civil war are impacted by a disaster, the likelihood of negotiations is likely to be unchanged.*

The Philippines is illustrative of this logic as it experiences multiple typhoons a year. Walch’s (2014, 2018) research highlights the effect of Typhoon Bopha on the civil war dynamic between the NPA and the Philippine government. Typhoon Bopha hit Mindanao in 2012 and greatly impacted the NPA’s area of control (Walch, 2018). While the typhoon did not lead to more conflict and produced localized truces, no peace negotiations occurred and the government increased its presence and operations in NPA territory (Walch 2014, 2018). The behavior of the NPA is consistent with the logic of Hypothesis 2. As Walch (2018) notes, the NPA declared unilateral ceasefires when faced with the devastation of a typhoon in order to regroup and recover. Conversely, when typhoons hit other parts of the Philippines, no such ceasefires were announced by the NPA (Walch, 2018).

# Data and methods

 To test how disaster affects the propensity of combatants to agree to negotiations in intrastate conflicts, we utilize the dyadic UCDP/PRIO Armed Conflict Database (Harbom, Melander & Wallensteen, 2008; Pettersson & Oberg, 2020). Internal armed conflicts are defined as ‘a contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths in a calendar year’ (Pettersson, 2020: 1). We focus on conflicts where territory served as the incompatibility between the two sides. We believe that these disputes constitute a particularly difficult test for our theory, as these are often cited as both particularly violent and intractable (Walter, 2006, 2009). At the same time, we exclude conflicts that have taken on an internationalized dimension. That is, we omit conflicts where one side or the other has the assistance of third parties. Because neither side has the ability to draw resources from an actor independent of the country, the potential impact of disaster on negotiation can be more easily traced back to the original disaster event.

 Lastly, we consider the issue of temporal aggregation to our data (Rossana & Seater, 1995; Shellman, 2004). Selecting a time unit that is too large, such as a year, would affect ‘most properties existing at the disaggregated frequency’ (Marcellino, 1999: 133). A year, as a temporal aggregation choice, could plausibly wash out the specific impact that disasters may have. A small-scale disaster, such as a localized storm, may have a very short-term impact; such an effect would be overwhelmed by a larger-scale disaster that might occur later in the year. We would also lose effects associated with particular types of disaster, such as those suggested by Nel & Righarts (2008) in their slow-onset/rapid-onset dichotomy. Taking a temporal unit that is too small, such as a day or week, would also impact our inferences by introducing additional variance that would impede our ability to find a meaningful statistical relationship.

 Taking these concerns in mind, our data are monthly by conflict/dyad. This, we feel, strikes a reasonable balance. Through the use of months, we create meaningful variance that allows for changes in conflict and for the differential temporal impact of disaster while keeping our analysis tractable. This decision, along with our focus on territorial civil wars and the availability of our independent and control variables, results in a dataset consisting of 67 conflicts involving 112 different dyads from 1980 to 2005.

*Dependent variable*

 Our dependent variable is a simple dichotomous variable indicating whether “negotiations were held regarding the resolution of conflict between the government and rebel group” (Ogutcu-Fu, 2016: 409). Negotiations are defined broadly; these include traditional talks between the combatant sides regarding the cessation of conflict, preparatory talks, and negotiations between the political wing of a rebel organization and the government (see Ogutcu-Fu, 2016). This broader definition, we believe better encompasses the totality of negotiation ranging from hastily prepared discussions to more elaborate – and carefully orchestrated – summits. We use the included dates from the negotiation data to recode these data at monthly intervals. These data are available from 1980 to 2005.

## *Independent variables*

 To assess the impact of disasters, we use the EM-DAT International Disaster Database (CRED, 2020). Disasters enter the database if they fulfill four criteria: ten or more people are reported killed, a hundred or more people are reportedly effected, a state of emergency is declared, and a call for international assistance is made. Disasters in EM-DAT are classified into two main types: natural and technological. We focus solely on natural disasters. This reduces the possibility that a disaster endogenous to the conflict – like the destruction of infrastructure due to fighting – affects the likelihood of negotiations.

 In order to incorporate disasters into the civil war data, we record its timing and location. The timing allows us to determine whether the disaster event occurred during the conflict and whether it contributed to the decision to negotiate. Because we believe that disaster has differential effects based on whose territory it victimizes, precisely attributing disaster location to one of the combatant sides, or both, becomes important. To do so, we compare the location of the disaster event to the territorial claim of the rebel organization. We determine the former by using the location provided in the EM-DAT data. In the case of the latter, we utilize the *territory\_name* variable from the dyadic UCDP/PRIO Armed Conflict Database to determine rebel territorial claims (Harbom, Melander & Wallensteen, 2008; Pettersson & Oberg, 2020). This leads to the creation of 4 dichotomous variables: *Disaster in rebel area –*denoting whether a disaster occurred within rebel territory, *Disaster in government area* – indicating a disaster did not take place within rebel territory, *Disaster in both areas* – noting whether both combatants’ territories are affected by the disaster, and *No disaster* – an indicator for whether neither side’s territories are affected. Because negotiations may not immediately happen after a disaster, we run models that code 1-4 months after the disaster event.

## *Control variables*

 We consider a number of control variables that affect the likelihood of negotiation. We first control for the impact of past negotiations; if governments and rebels have engaged in negotiations in the past, they may make them more likely to negotiate in present. This is the case, for example, with preparatory negotiations as they often lead to comprehensive negotiations down the road. This relationship could potentially bias our analyses. To account for this, we include a variable denoting the sum total of all negotiations between the two sides from the beginning of the conflict to the observation in question.

 Following Brandt et al. (2008), we believe that negotiations are more likely to happen in those states with higher levels of development. This may occur simply due to the opportunity costs of conflict; governments may wish to bring an end to conflict in order to limit its economic impact. This factor is likely to negatively impact rebel economic prospects as well, also leading rebels to the negotiating table (Collier, Hoeffler & Söderbom, 2004). We assess this by using a measure of GDP per capita from Gleditsch (2002). We log this to account for outliers.

 A country’s population is likely to affect the likelihood that the combatants press for negotiation. This may occur for a variety of reasons. Fearon & Laitin (2003) argue that larger populations are harder to administer; this makes it more difficult for the state to exert control and curb rebellious populations. Secondly, larger populations may simply have more insurgents and supporters, making it harder for the government to ascertain accurate information about their challenger, reducing the chances for negotiation (Raleigh & Hegre, 2009; Walter, 2009). To assess the potential effect of population, we log Gleditsch’s (2002) population measure.

 We also account for the impact of terrain. Rebel forces often take advantage of rough terrain to evade government forces or, in other instances, engage the state on more favorable terms (Fearon & Laitin, 2003). For the government, this complicates the ability to know the true strength of the opponent, which increases both the duration of conflict and the likelihood that that rebel group is included at the negotiating table (Cunningham, 2011; Walter, 2009). We consider this by using a measure of terrain ruggedness from Nunn & Puga (2012). We use this measure because it better accounts for ‘small-scale terrain irregularities such caverns, caves, and cliff walls’ in addition to larger scale terrain that might be useful for rebel forces in battles with governments (Nunn & Puga, 2012: 21). These data are aggregated at the country level, thus providing an overall assessment of terrain ruggedness. To account for its potential diminishing effect on negotiations, we log this variable

 We include a control for a country’s ethnic fractionalization. Horowitz (1985) notes that ethnically diverse societies may be better able to negotiate and settle conflict. This occurs because these state’s institutions have been designed, through custom and policy, to facilitate communication and foster accommodation and compromise (Fearon & Laitin, 1996; Horowitz, 1985). To assess the impact of ethnicity, we use the ethnolinguistic fractionalization measure from Fearon & Laitin (2003). This assesses the probability that two randomly drawn individuals within a county are from different ethnic groups.

 Rebel strength is likely to impact the likelihood of negotiation. Clayton (2013) notes that strong rebels are more likely than their weaker counterparts to overcome the bargaining problems than impede conflict resolution. This occurs because, first, a strong rebel group is able to inflict significant costs on the state. Knowing this, the government is more likely to try to negotiate. Second, strong rebels are also better able to defend themselves in those situations where the state reneges on an agreement. With the commitment problem reduced, strong rebels are likely to create a settlement process and find an agreement. To measure this, we use the rebel group strength variable from the Non-State Actor dataset (Cunningham, Gleditsch & Salehyan, 2013). This variable is divided into five categories noting whether the rebels are much weaker, weaker, at parity, stronger, or much stronger than the government. We expect that as rebel strength increases, the likelihood of agreement increases.

 During the Cold War, combatant sides could trust on the support of one of the two superpowers should they renege on negotiations or settlements (Hartzell & Hoddie, 2007). The diminution of resources available since that time means that sides no longer have a credible recourse to war should discussions not go their way. We denote this era through the use of a dichotomous variable; values of 1 indicate years between 1980 and 1989.

 Finally, we control for country regime type. Like Walter (2002), we expect that democratic states will be positively associated with negotiation attempts. We measure this through using V-Dem’s polyarchy index (Coppedge et al., 2021; Teorell & Lindberg, 2019). This variable, measured on a 0-1 scale, assesses a country’s freedom of association, suffrage, free elections, elected executive, and freedom of expression. We expect higher scores to be related to a higher likelihood of negotiations.

 Because our dependent variable is a simple indicator denoting whether negotiations have occurred within a conflicting dyad, we use a logistic regression. We cluster our standard errors on the dyad, allowing us to account for unobserved factors that may impact the chance of negotiation within the conflict dyad. Finally, to account for the possibility of temporal autocorrelation, we include cubic polynomials of time (Carter & Signorino, 2010).

**Results**

 The results from our analyses are presented in Table I. These indicate that, with the exception of Model 1, disasters occurring in the territories of both rebels and governments increase the likelihood of negotiation, supporting Hypothesis 1. We note that the effect is not immediate; disasters have no effect on negotiations occurring in the same month. In the immediate aftermath of a disaster, both sides are likely gathering information on the its impact and the ways that it might affect their opponents – and their own – possibility of victory. This can occur because the sides have either not yet known the true scale of the disaster, might be turning inward to provide relief to their affected territories, or might be hampered in information gathering due to infrastructure damage. The passage of time, as shown in Models 2-5, appear to make rebels and governments more circumspect, leading to a greater likelihood of negotiation.

 We see mixed, although mainly non-significant results for disasters that solely occur within government or rebel territory. To us, even in those cases where we find an effect, like Models 2 and 4, suggests that the non-affected side sees a window for military victory, leading to a decreased – or an unchanging – likelihood of negotiation. All in all, this supports Hypothesis 2.

 The substantive effects of our *Disaster in both areas* variable are meaningful, as shown in Table II. When disasters strike both sides, the likelihood of negotiation increases by more than double, depending on the length of the follow-on period. This suggests that disasters seem to impact each side’s fighting capability and their belief in victory; this convergence appears to open a possibility for negotiations.

 Of course, negotiations themselves do not mean that the sides are truly interested in ending conflict. A disaster that strikes both sides may prove to be the ideal time to call for negotiations since the time used in diplomacy can be used to consolidate gains or to staunch the losses that have already occurred. Alternatively, both sides may also simply want the time to provide relief to their supporters. This may be borne out of a sense of genuine concern for the people under their control, or it may be a cynical ploy to prop up support. It would be difficult to ascertain which of these concerns drive the decision to call for negotiation, but this effect nonetheless remains.

 Regarding our control variables, we find significant and expected results for both Cold War and rebel strength across our models. In the case of the Cold War, conflict months are less likely to experience a negotiation, a result that is attributable to external support received by the participants (Hartzell & Hoddie, 2007). We also find that conflict months with stronger rebel groups are more likely to see negotiation. As expected, stronger rebels are better able to push for their goals, increasing the likelihood that governments will seek to answer their demands by starting negotiations (Clayton, 2013).

 We also wish to see whether the effect of disasters on negotiation can be driven by the type of disaster. Nel & Righarts (2008) find that rapid-onset disasters, such as earthquakes and volcanos, are more likely to lead to civil conflict than slow-onset disasters.[[3]](#footnote-3) This is largely due to the immediacy of the effects, rapid-onset disasters can lead to the loss of life, the degradation of the state, disease, and hunger. Slower-onset disasters may have the same effect over time; but their impact on conflict is lessened by their lack of immediacy and their cloudy causal path.

 In Table III, using the same statistical model as in Table I, we present results from our analyses of only rapid-onset disasters. Here, our results are generally similar to our previous ones, but less robust. Only two models show statistical significance for both sides being hit. These less robust effects may be due to both temporal and spatial aggregation – if a rapid-onset disaster impacts a small scale, it may be difficult to ascertain who controls the specific locale. Additionally, the effects of some of these disasters are ephemeral, having a very short-term impact on the likelihood of negotiation. In both respects, more theorizing and more precise methodology may be needed to better measure the costs of a rapid-onset disaster to the rebels or government.

## discussion and conclusion

 This research found that the effect of natural disasters is not uniform and depends on where the disaster hits. Disasters that hit both the government and rebels increased the likelihood of negotiations in all models, excepting Model 1. This effect was less robust when looking at rapid-onset disasters.

 The results of this work help to address some of the divergent findings about the effect of natural disasters on the outcome of civil wars; some arguing that they will lengthen the duration of civil wars while others contend that it will shorten them. We argue that these different effects could be driven by where the natural disaster strikes and whether the rebels or government are primarily in charge of those areas. Rather than measuring the effect of disaster by noting whether a country is affected or not, this article attempts to disaggregate where disasters hit and the indirect pathways that impacts negotiations (von Uexkull & Buhaug, this issue).

 These results also support the idea of how exogenous shocks to government and rebel resources can promote negotiations. One implication of these findings is that outside actors to a civil war may be able to see when natural disasters present an opportunity to promote negotiations between warring sides. If disasters primarily have an effect based on where it hits, not all disasters will create the right moments for negotiation.

 These points raise some additional areas of research. First, while we mention the role that international and domestic opinion might play in creating a cost to trying to win militarily after both sides are hit by a disaster, future research could explore how domestic and international actors influence the decision of government and rebel leaders and whether their influence is conditional on state or rebel characteristics. Second, while we generally found support for our hypothesis about when both sides of a civil war are hit, negotiations are more likely, there are cases that demonstrate this is not always the case. Research into the differing effects of the 2004 tsunami suggest that our theoretical argument on negotiations being more likely when both sides do not see a short-term path to victory generally holds, but there is more nuance about how groups and governments experience a disaster. How a group funds itself may limit how costly a disaster is (Beardsley & McQuinn, 2009) and thus influence the mutual expectation of the need for negotiations. Relatedly, disasters may impose widespread devastation on a country but may not impact the war fighting capabilities of the group or government. More precise measurements of how disasters impact groups and governments could address the lack of empirical support in a few models and provide a more precise evaluation of the theoretical argument.

 Another possible extension would be to consider how the presence of multiple rebel groups and paramilitary organizations influences the effect of disasters on negotiations especially if these different groups are geographically spread out across a country. A few different factors may drive this dynamic. First, governments may be unwilling to negotiate unless they themselves and all present rebel groups are impacted by the natural disaster. Doing otherwise might set a dangerous precedent for negotiations. Alternatively, governments may be more likely to pursue negotiations in order to limit the amount of conflicts it has to address after experiencing a conflict. Relatedly, cooperation and conflict across rebel groups may influence how a group perceives the utility of negotiations and military operations after a disaster.

 The accompanying articles in this issue also suggest a variety of additional research questions that connect to our work. First, theorizing and modeling how rebels control their territory, particularly after a natural disaster, could explain when they may see the costs of a disaster and thus the need to negotiate. This might include to what extent rebels rely on coercion and civilian victimization to retain control after a natural disaster (Haer & RezaeeDaryakenari, this issue). Second, extending the data to government-based civil wars and internationalized civil wars open up some interesting opportunities, given that these are more complex in terms of actors, the nature of territorial control, and other negotiation issues. Drawing on Lee et al. (this issue), it might be interesting to see at what level of internal unrest and destruction does a regime use diversionary external force versus settling with internal disputants. Similarly, modeling the impact of other actors into this process could help further our understanding of when negotiations are likely. For example, if governments can replace lost resources and troops with paramilitary forces (Koehnlein & Koren, this issue), they may not need to engage in negotiations.

 Understanding how perceptions of rebel groups that are different ethnically, religiously, or linguistically influence negotiations could further shed on light on the complex effect of disasters as Chung & Rhee (this issue) find that disasters further negative perceptions of other groups. Finally, how outside actors engage in disaster recovery (Belligoni, this issue; Duda & Kelman, this issue) could also provide additional theories and approaches to understanding how disasters shape the likelihood of negotiations.

Data replication: The dataset and do-files for the empirical analysis in this article, along with the online appendix are available at: <http://www.prio.org/jpr/datasets> or [www.stephennemeth.org/research](http://www.stephennemeth.org/research). All analysis were conducted using Stata 16.

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BRIAN LAI,

Table I.Logistic estimation of disaster impacts on negotiation attempts in territorial civil wars, 1980-2005

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) |
| Disaster in rebel area | -.656(.584) |  |  |  |  |
| Disaster in gov’t area | -.036(.403) |  |  |  |  |
| Disaster in both areas | .430(.339) |  |  |  |  |
| Disaster in rebel area (+ 1 following month) |  | -1.179\*(.548) |  |  |  |
| Disaster in gov’t area (+ 1) |  | -.127(.294) |  |  |  |
| Disaster in both areas (+ 1) |  | .691\*(.278) |  |  |  |
| Disaster in rebel area (+ 2) |  |  | -.294(.284) |  |  |
| Disaster in gov’t area (+ 2) |  |  | -.276(.325) |  |  |
| Disaster in both areas (+ 2) |  |  | .878\*\*(.267) |  |  |
| Disaster in rebel area (+ 3) |  |  |  | -.533\*(.242) |  |
| Disaster in gov’t area (+ 3) |  |  |  | -.274(.389) |  |
| Disaster in both areas (+ 3) |  |  |  | .817\*(.320) |  |
| Disaster in rebel area (+ 4) |  |  |  |  | .100(.262) |
| Disaster in gov’t area (+ 4) |  |  |  |  | -.405(.418) |
| Disaster in both areas (+ 4) |  |  |  |  | .880\*(.382) |
| Number of past negotiation attempts | .023(.022) | .018(.021) | .013(.020) | .013(.020) | .010(.020) |
| VDEM polyarchy index | -1.068(1.282) | -1.080(1.240) | -1.131(1.219) | -1.117(1.202) | -1.137(1.186) |
| Real GDP per capita  | -.131(.223) | -.107(.224) | -.104(.228) | -.111(.228) | -.132(.232) |
| Population | -.060(.123) | -.061(.121) | -.055(.132) | -.050(.161) | -.045(.169) |
| Terrain ruggedness | -.036(.217) | -.037(.216) | -.034(.221) | -.023(.222) | -.024(.225) |
| Ethnic fractionalization | .009(.860) | .018(.860) | -.049(.870) | -.049(.851) | -.130(.856) |
| Cold war | .730\*(.345) | .721\*(.348) | .711\*(.349) | .705\*(.357) | .719†(.368) |
| Rebel strength | .764\*(.351) | .794\*(.355) | .829\*(.366) | .836\*(.371) | .860\*(.385) |
| Time | -.510\*\*(.098) | -.504\*\*(.097) | -.500\*\*(.097) | -.499\*\*(.098) | -.499\*\*(.097) |
| Time2 | .012\*\*(.003) | .012\*\*(.003) | .011\*\*(.003) | .011\*\*(.003) | .011\*\*(.003) |
| Time3 | -.000\*\*(.000) | -.000\*\*(.000) | -.000\*\*(.000) | -.000\*\*(.000) | -.000\*\*(.000) |
| Constant | .949(2.306) | .790(2.356) | .777(2.469) | .791(2.630) | .961(2.717) |
|  |  |  |  |  |  |
| Observations | 4,555(75) | 4,555(75) | 4,555(75) | 4,555(75) | 4,555(75) |
| Wald chi2 | 373.53\*\* | 288.27\*\* | 294.99\*\* | 329.72\*\* | 289.27\*\* |
| Log likelihood | -373.30 | -370.09 | -367.79 | -367.94 | -366.87 |

† p<.1, \* p<.05 \*\* p<.01. Robust standard errors clustered on dyad in parentheses. GDP per capita, population, and terrain ruggedness are log transformed.

Table II.Change in predicted probability for estimates from Table I

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) |
| Disaster in both areas (+ 1) |  | 99.60% |  |  |  |
| Disaster in both areas (+ 2) |  |  | 140% |  |  |
| Disaster in rebel area (+ 3) |  |  |  | -41.36% |  |
| Disaster in both areas (+ 3) |  |  |  | 126.21% |  |
| Disaster in both areas (+ 4) |  |  |  |  | 140.60% |
| Cold war | 107.60% | 105.46% | 103.76% | 102.46% |  |
| Rebel strength | 57.02% | 55.78% | 59.10% | 59.69% | 61.44% |

Table III.Logistic estimation of rapid-onset disaster impacts on negotiation attempts in territorial civil wars, 1980-2005

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | (1) | (2) | (3) | (4) | (5) |
| Disaster in rebel area | -.607†(.368) |  |  |  |  |
| Disaster in gov’t area | -.247(.418) |  |  |  |  |
| Disaster in both areas | -.142(.573) |  |  |  |  |
| Disaster in rebel area (+ 1 following month) |  | -1.249\*\*(.369) |  |  |  |
| Disaster in gov’t area (+ 1) |  | -.387(.364) |  |  |  |
| Disaster in both areas (+ 1) |  | .511(.452) |  |  |  |
| Disaster in rebel area (+ 2) |  |  | .002(.234) |  |  |
| Disaster in gov’t area (+ 2) |  |  | -.579(.397) |  |  |
| Disaster in both areas (+ 2) |  |  | .764†(.390) |  |  |
| Disaster in rebel area (+ 3) |  |  |  | -.196(.219) |  |
| Disaster in gov’t area (+ 3) |  |  |  | -.604(.497) |  |
| Disaster in both areas (+ 3) |  |  |  | .669†(.400) |  |
| Disaster in rebel area (+ 4) |  |  |  |  | -.093(.236) |
| Disaster in gov’t area (+ 4) |  |  |  |  | -.658(.547) |
| Disaster in both areas (+ 4) |  |  |  |  | .638(.450) |
| Number of past negotiation attempts | .028(.021) | .027(.021) | .026(.020) | .027(.019) | .027(.018) |
| VDEM polyarchy index | -.969(1.263) | -.962(1.222) | -1.019(1.211) | -.953(1.173) | -.911(1.142) |
| Real GDP per capita  | -.157(.218) | -.150(.218) | -.163(.222) | -.169(.222) | -.185(.221) |
| Population | -.011(.129) | .006(.144) | .021(.165) | .041(.200) | .054(.211) |
| Terrain ruggedness | -.016(.214) | -.002(.214) | -.003(.218) | .008(.218) | .015(.217) |
| Ethnic fractionalization | .003(.854) | .013(.844) | -.071(.853) | -.096(.822) | -.151(.792) |
| Cold war | .685\*(.315) | .655\*(.308) | .646\*(.307) | .644\*(.320) | .648\*(.319) |
| Rebel strength | .766\*(.352) | .790\*(.355) | .819\*(.367) | .841\*(.377) | .859\*(.382) |
| Time | -.516\*\*(.096) | -.512\*\*(.096) | -.507\*\*(.096) | -.507\*\*(.097) | -.507\*\*(.097) |
| Time2 | .012\*\*(.003) | .012\*\*(.003) | .012\*\*(.003) | .012\*\*(.003) | .012\*\*(.003) |
| Time3 | -.000\*\*(.000) | -.000\*\*(.000) | -.000\*\*(.000) | -.000\*\*(.000) | -.000\*\*(.000) |
| Constant | .690(2.283) | .501(2.365) | .537(2.505) | .409(2.713) | .453(2.747) |
|  |  |  |  |  |  |
| N(Dyads) | 4,555(75) | 4,555(75) | 4,555(75) | 4,555(75) | 4,555(75) |
| Wald chi2 | 327.06\*\* | 340.62\*\* | 360.98\*\* | 439.52\*\* | 367.38\*\* |
| Log likelihood | -373.97 | -371.56 | -369.52 | -369.83 | -369.72 |

† p<.1, \* p<.05 \*\* p<.01. Robust standard errors clustered on dyad in parentheses. GDP per capita, population, and terrain ruggedness are log transformed.

1. The scope of our research is on intra-state conflicts as opposed to internationalized intra-state conflicts (e.g. US entrance into the Afghanistan civil war in 2001). Intra-state conflicts do have the presence of third parties but these actors are not sending troops to fight in the conflict. In a post-disaster situation, outside actors are not warring parties but part of a relief mission. Their presence can impact either side but they are not directly engaging in fighting on one side. [↑](#footnote-ref-1)
2. In this context, we mean that a natural disaster is an exogenous shock because where the natural disaster hits is not correlated with, or driven by the conflict or the actions of the government or rebels. The natural disaster is very likely to reveal important information about the side that is hit. [↑](#footnote-ref-2)
3. Earthquakes, volcanos, extreme temperatures, floods, landslides, waves/surges, wildfires, storms, insect infestations, and epidemics are rapid-onset disasters. Droughts and famines are slow-onset disasters. [↑](#footnote-ref-3)